

We claim:

1. A dichroic neutral density optical filter comprising:
 - a substrate;
 - a plurality of dielectric thin film layers disposed on the substrate to provide a wavelength response of the dichroic neutral density filter having
 - a first highly reflective region,
 - a second highly reflective region, and
 - a transmissive region between the first highly reflective region and the second highly reflective region having a selected neutral density transmission across a selected wavelength range of at least about 25 nm.
2. The dichroic neutral density optical filter of claim 1 wherein transmission in the selected wavelength range has less than $\pm 20\%$ ripple relative to an average transmission of the selected wavelength range.
3. The dichroic neutral density optical filter of claim 2 wherein the average transmission is between 50% and 3.5%.
4. The dichroic neutral density optical filter of claim 1 wherein the selected neutral density transmission is at least 5% and transmission over the selected wavelength range varies less than $\pm 2.5\%$
5. The dichroic neutral density optical filter of claim 1 wherein the selected wavelength range is within a visible spectrum.
6. The dichroic neutral density optical filter of claim 5 wherein at least one of the first highly reflective region and the second highly reflective region is in the visible spectrum.
7. The dichroic neutral density optical filter of claim 6 wherein at least one of the first highly reflective region and the second highly reflective region is about 100 nm wide.

8. The dichroic neutral density optical filter of claim 6 wherein each of the first highly reflective region and the second highly reflective region is greater than 100 nm wide in the visible spectrum.

9. The dichroic neutral density optical filter of claim 8 wherein the selected wavelength range is about 100 nm wide.

10. The dichroic neutral density optical filter of claim 8 wherein the selected wavelength range at least 50 nm wide.

11. The dichroic neutral density optical filter of claim 1 wherein the selected wavelength range is about 100 nm wide.

12. The dichroic neutral density optical filter of claim 10 wherein the selected neutral density transmission is between about 6% to about 12% in a green portion of the visible spectrum.

13. The dichroic neutral density optical filter of claim 1 wherein the plurality of dielectric thin film layers includes a first portion comprising a long stop filter and a second portion comprising a short stop filter.

14. The dichroic neutral density optical filter of claim 13 wherein the long stop filter is disposed between the substrate and the short stop filter.

15. The dichroic neutral density optical filter of claim 14 wherein the short stop filter is a blue reflective filter and the long stop filter is a red reflective filter.

16. The dichroic neutral density optical filter of claim 1 wherein the transmissive region has a 50% width that is less than the selected wavelength range.

17. The dichroic neutral density optical filter of claim 16 wherein at least one of the first highly reflective region and the second highly reflective region has a selected leakage between about 0.25% and 1.5%.

18. The dichroic neutral density optical filter of claim 16 wherein the first highly reflective region has a selected leakage between about 0.25% and 1.5% in a red portion of a spectrum.

19. The dichroic neutral density optical filter of claim 1 wherein at least one of the first highly reflective region and the second highly reflective region has a selected leakage between about 0.25% and 1.5%.

20. The dichroic neutral density optical filter of claim 19 wherein the first highly reflective region has a first selected leakage between about 0.25% and about 1.5% and the second highly reflective region has a second selected leakage between about 0.25% and about 1.5%.

21. The dichroic neutral density optical filter of claim 16 wherein the 50% width and a center wavelength between 50% points of the transmissive region are selected according to a spectral output of an illuminant.

22. A dichroic neutral density optical filter comprising:
a substrate;
a plurality of dielectric thin film layers disposed on the substrate to provide a wavelength response of the dichroic neutral density filter having
a first highly reflective region having a first selected leakage,
a second highly reflective region, and
a transmissive region in a visible region of the spectrum between the first highly reflective region and the second highly reflective region having a selected average reflection between about 3.5% and about 25% across a wavelength range of at least about 25 nm.

23. A dichroic neutral density optical filter comprising:
means for reflecting essentially all light over a first portion of a visible spectrum;

means for reflecting between 96.5% and 50% of light over a second portion of the spectrum, the second portion of the spectrum being at least 25 nm wide and providing a neutral density factor between 0.3 and 1.5; and

means for reflecting essentially all light over a third portion of the visible spectrum, wherein the second portion of the visible spectrum is between the first portion and the third portion.